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PRIZE ESSAY,

ON THE

ZYMOTIC THEORY OF ESSENTIAL FEVERS AND OTHER DISORDERED CONDITIONS OF THE BLOOD; TOGETHER WITH AN APPENDIX ON MEDICAL THEORIES AND VITAL STATISTICS.

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"I PROFESS A LIBERAL MEDICINE: I AM NEITHER OF THE OLD SECTS NOR NEW, BUT FOLLOW WHEREVER THEY CULTIVATE TRUTH."--Klenius.

There are few inquiries in pathological science of more interest than those which relate to changed conditions of the Blood; for whether we regard it as endowed with a distinct vitality, and obedient to the general laws of cellular growth, development and decay; or as ministering to the nutritive and textural wants of the system in the elaboration of fibrin from elements furnished by primary assimilation; or as connected with important chemical changes essential to a healthy action of the system;—whether we regard the blood as contributing to one or more of these purposes in the animal economy, it becomes at once evident that destruction of its vitality, or change in any of its constituent elements, must be followed by serious constitutional disturbances. Hence the interest with which its diseases should be studied, and the importance of understanding, in a curative point of view, the primary or secondary impression of disease upon this fluid.

It must be confessed, however, that the question of *priority* or *sequence* although of much interest to him who thinks or reasons about the nature, origin and phenomena of disease, is often one of difficult solution. But to arrive at greater certainty on this point, if possible, so far at least as relates to the Essential Fevers, is the object of this Essay: and if I shall succeed in any degree in pointing out the distinction between *symptoms* of diseased action and *diseased action itself*, I will have, to some extent at least, accomplished my object.

In M. Andral's classification of Lesions, in which he makes *all* disease to exist, he embraces some in which no *notable* change of either *organization* or *composition* can be detected. Yet it is worthy of in-

quiry as to whether this eminent pathologist has not included in his lesions, some which are but *symptoms*, not properly diseases—*actions* and not *states*.

It is not my purpose, however, at present, to enter this field of inquiry. I desire to call attention to another question in which no such controversy can arise.

In the Essential or Idiopathic forms of fever it is evident that change has been induced in the blood by the admixture of *foreign matters*. The proof of this consists in the fact: 1st, That diseases analogous to those fevers have been induced by injecting putrid matter into the veins of animals: 2nd, These fevers are readily produced by the introduction of animal poisons into the blood, as in the case of small pox, measles, &c.: 3d, These poisons are known to operate through the medium of the air, by thus gaining access to the blood through the lungs: 4th, The non-contagious fevers, such as Intermittents and Remittents, are universally admitted to depend upon a poisoned or changed condition of the atmosphere: 5th. Actual observation establishes the fact that the blood *is* altered in all Essential or Idiopathic fevers.

The best point of departure, therefore, is the general fact (for it should be regarded as such), that all Essential fevers depend *primarily* on a poisoning of the Blood, and the proof as to primary impression will be given in illustration of the facts already cited.

It must not be inferred, however, that I am laboring to establish the *identity* of fevers. No such inference can be legitimately drawn from any fact or reason which I shall present. True, so far as the general fact is concerned that all foreign matters, when introduced into the blood, change either its physical, chemical, or vital properties, all Essential fevers may be regarded as a *unit*: Yet observation abundantly establishes the fact that different poisons act differently on the human constitution, and upon the peculiar and specific character of each depends not only the destructive effect on the blood, but the local lesions that will ensue. Urea and its compounds, if retained in the blood, affect the brain and nervous system, and are apt to give rise to a low grade of inflammation in serous and sero-fibrous tissues; while mucous structures will suffer but little. But the small pox virus spends its force upon mucous and cutaneous structures, and leaves, unharmed, the serous and fibrous structures.

There can be no explanation given of this other than the general fact that the tissue or viscus affected seems to be that which has an affinity for the poison which has to be eliminated from the blood. In this process of elimination, inflammation and its sequela are excited, and local disease becomes manifest. Hence all Essential fevers should be regarded as distinct in species *according to the circumstance of the primary sedative impression*. This is the only true and rational classification of fevers.

We feel authorised in asserting, then, as a starting point in our reasonings,—what observation abundantly establishes,—that each specific miasm has its own peculiar and distinct law of development. But in the absence of reliable information as to the *essential nature* of these miasms it would be idle to speculate. Our knowledge on this point, must, at least for the present, rest on observation.

But it will be at once perceived that our knowledge of the action of remedial agents is not more certain. Indeed the perfect analogue of one is found in the other, and the reasoning applied to one applies with equal force to the other. Thus, that Mercury will excite inflammation of the salivary glands; Arsenic, the mucous structures; Belladonna, the skin; Ergot, the uterus; &c., has long been a matter of observation. But *why* they should do so is just as obscure as why the Typhoid poison should select for its destructive action the glands of Peyer, or the Small Pox poison should spend its influence upon the dermoid structures. The articles of the *Materia Medica* furnish a just illustration of the action of all foreign substances in the production of disease. Mercury, Arsenic or Croton oil, if uncontrolled by the judicious skill of the physician, is capable of giving rise to diseased action with as much certainty and as varied in its manifestations, as either of the animal poisons to which I have alluded; and analogy would lead us to suppose that if we could *control* the one, as we can the other, miasmatic poisons might be used as therapeutic agents. That all agents that affect the vitality or composition of the blood, bear certain general pathological relations, cannot be doubted: but that by no means proves the doctrine of identity. As well might we assert the identity of Small Pox and Typhus fever from the fact that the fibrin of the blood is found defective in both.

An important point, however, to be established, before conclusions are drawn, is the fact that the blood does undergo change in dis-

ease, and from medication, diet, &c.; for if this be denied, our conclusions will be without a predicate, and therefore unsound. But the chemists, have, happily, settled this point by furnishing us accurate analysis of the blood both in health and disease. In the condition of health the venous blood of a man, as represented by the number 1000, is composed of

| | | |
|----------------------------|-----------|----------|
| Serum | - - - - - | 869.1547 |
| Globules (fibrin included) | - - - - - | 130.8453 |

1000

This varies, however, according to sex, age, temperament, kinds of food, evacuations, &c. The rapidity with which some of the solid constituents of the blood are diminished by blood-letting, for example, is very remarkable. Thus, according to the researches of Dumas, the blood of a robust young man of 23 years of age gave :

At the first venesection,

| | | |
|-------------------------------|-----------|---------|
| Water, | - - - - - | 780.210 |
| Globules, | - - - - - | 139.129 |
| Albumen, | } | 80.661 |
| Salts, | | |
| Fatty and extractive matters, | | |

1000

At the third venesection,

| | | |
|-------------------------------|-----------|--------|
| Water, | - - - - - | 853.46 |
| Globules, | - - - - - | 76.19 |
| Albumen, | } | 70.35 |
| Salts, | | |
| Fatty and extractive matters, | | |

1000

The more solid constituents of the blood, it will be seen, are rapidly supplied by a compensating quantity of non-sanguinous fluid; and hence the value of blood-letting when it is desirable to promote absorption.

Diet and drinks also very readily affect the constitution of the blood. According to M. Dennis, in the blood of a young man of 21 years of age, were found :

| | | |
|---------------|-----------|-----|
| Water, | - - - - - | 770 |
| Globules, | - - - - - | 154 |
| Albumen, &c., | - - - - - | 76 |

1000

And after 40 days use of watery drinks :

| | | | | |
|-----------|---|---|---|-------|
| Water, | - | - | - | 804 |
| Globules, | - | - | - | 111.9 |
| Albumen, | - | - | - | 84.1 |

1000

It will be thus seen that the blood is very readily changed in its constitution by blood-letting, diet and exercise. It sustains direct relations also, to the air we breathe, to the water we drink, to the food we eat, and to the excretions of the body by which it is purified : and that a fluid which is presented to us in such a compound and complicated form, and sustaining so many relations to the various modifying influences which surround it, should not become a frequent seat of *disease*, would be indeed an anomaly in nature.

Among the various hypotheses to account for fever, a Zymosis, or fermentation of the Blood, has prevailed under one form or other from a remote antiquity. But it has been so inseparably connected with the old Humoral pathology that it has received little consideration. Recently this hypothesis (for I shall regard it as such at present) has been rendered, to say the least of it, very plausible by the researches of the distinguished Liebig.

In his "Animal Chemistry" he calls attention to the fact that no other component part of the organism can be compared to the Blood in respect of the feeble resistance it offers to exterior influences, and the reason assigned is, that "it is not an organ which is formed, but an organ in a state of formation." The following quotation embodies in a few words, the main leading thought of the author on this subject:—

"The Chemical force and the Vital principle hold each other in such perfect equilibrium, that every disturbance, however trifling, or from whatever cause it may proceed, effects a change in the blood."

This, then, is an important starting point in our reasoning process; for if it be really possessed of a low vitality, we may logically arrive at the conclusion, by an *a priori* argument, if we knew nothing of the facts, in confirmation of it, that all fevers, produced by endemic, epidemic, or infectious causes, have their origin in a primary diseased condition of the blood.

A Zymotic change of the blood is due, according to Liebig, to a decomposing organic molecule in the interior of the human body. This molecule, by a law of catalysis, induction, or contact, has the

power of imparting its own motion to another molecule with which it may be in contact. Hence chemists have defined it to be "decomposition by contact," or the "action of presence." We have illustrations of this law in the power which small quantities of substances, in a state of change, possess of causing unlimited quantities to pass into the same state: and it is an interesting fact, worthy of note in this connection, that all substances which readily suffer this transformation are, without exception, bodies which contain *nitrogen*. A large portion of the blood being composed of this element, we might readily conclude that it is the vital principle alone that keeps it from spontaneously passing into this condition of transformation. If the catalytic force be greater than the resistance offered by the Vital principle, the blood must pass into a condition of decomposition.

It may be asked, however, with reference to this law of Zymosis or induction: Is there any evidence to show that the introduction of putrid matter into the animal system does give rise to effects which are at all comparable with those of fever? If not, the law which has been announced, is but a speculation, and at best an hypothesis. But let us see. "It is a fact," says Leibig, "that subjects in anatomical theatres frequently pass into a state of decomposition which is communicated to the blood of the living body." And the fact observed by Magendie, that putrifying blood, brain, eggs, &c., laid on recent wounds, cause vomiting, lassitude and death, after a longer or shorter interval, has never, as yet, been contradicted. Numerous experiments have demonstrated that putrid matter injected into the blood of healthy animals, will give rise to a set of symptoms which are very analogous to Typhus. "If a small portion of putrid matter," says Dr. Armstrong, "be accidentally introduced into the blood during dissection, or if the experiment be made upon the lower animals, it produces fever, having exactly the characters of Typhus under its continued form, and *no individual could confidently pronounce that it differed from it.*" Bernard has also shown that by injecting yeast or sugar into the circulation, many of the ordinary kinds of fermentation are excited, giving rise to a disease very analogous to Typhoid fever, accompanied by prostration of strength, bloody fluxes, ecchymosis, and a black and uncoagulated condition of the blood. "Lastly, it is," says Liebig, quoting from Henle, "a universal observation that the origin of epidemic diseases is often to be traced to the putrefaction of large quan-

tities of animal and vegetable matters; that miasmatic diseases are endemic in places where the decomposition of organic matter is constantly taking place, as in marshy and moist localities; that they are developed epidemically under the same circumstances after inundations; also in places where a large number of people are crowded together with insufficient ventilation, as in ships, prisons, and besieged places."

It is also worthy of note that these factitious fevers, produced by the introduction of deleterious substances directly into the blood, are analagous, both in their symptoms and pathological lesions, to those produced by the sting or bite of certain animals; they present, also, the same general class of symptoms that are present in Small Pox, malignant Scarlatina, and other eruptive diseases.

In Mr. Walker's work on Grave Yards, he also presents an array of facts which prove beyond all controversy that putrid animal exhalations have given rise to diseases that have raged like a pestilence or epidemic. He cites an instructive instance which occurred in 1733, at the parish of St. Saturnine, in Burgundy. A sexton, while letting down a corpse into the vault, accidentally broke a coffin which contained the body of a fat man that had been buried twenty-three days. A discharge of sanies followed, which greatly annoyed the assistants; and, "of one hundred and twenty young persons of both sexes, who assembled to receive their first communion, all but six fell dangerously ill, together with the *Cure*, the grave digger, and sixty other persons." The disease is described as a putrid, verminous fever, accompanied with hemorrhage, eruption and inflammation.

Facts in support of these views might be accumulated at great length. Dr. Francis Home communicated measles by means of a drop of blood from a patient affected with the disease. And the experiments of M. Gendrin, as given in Williams' Principles of Medicine, is a striking one in point:—"A man who had been skinning a diseased animal was seized with a putrid fever, attended with an eruption of sloughing pustules. Some blood taken from this man was injected with the cellular texture of the groin of a cat; the animal was soon after affected with vomiting of bile, dyspnoea, frequent, small and irregular pulse, dry, brown tongue, slight convulsions, and died seven hours after the injection." The same pathologist induced in animals various and severe symptoms, followed by death, by injecting into their veins

the blood of persons laboring under Small Pox. M. Dupuy and Lauret also communicated the malignant pustular disease known as "Charbon," by injecting into the veins of the healthy horse a minute quantity of blood of the diseased animal. Andral relates an extraordinary case in which a malignant fever, followed with pustular eruption and death, was occasioned by the mere contact of the lips with the diseased blood of an animal.

May we not, then, infer from these facts that the blood is the hot bed in which many malignant diseases are propagated, whether by ova, parasites, cellgerms, or zymotic action?

But our proof does not rest here. Clinical observation has long since established the alteration of the blood in diseases which are termed *putrid*: the blood appears to be in a partial state of *dissolution*: its vitality is destroyed, and its fibrin either not elaborated, or dissolved in the process of putrefaction. As a result of this decomposition an increased quantity of hydro-sulphate of ammonia has been found in the blood of patients suffering from Typhus and other malignant diseases; and hence the *alkaline* reaction of the urine that is so often observed to be present in these fevers.

These observations have been made the basis for the support of a great group of maladies which go by the name of Zymotic diseases, and include, according to the statistical nosology of Mr. Farr, small pox, chicken pox, all eruptive diseases, influenza, scurvy, purpura, ague, remittent fever, yellow fever, typhus, puerperal, plague, hospital gangrene, &c. And in proof of their Zymotic origin the fact has been offered—1st, That the vitality of the blood is low, and that it therefore readily suffers transformations; 2nd, That we can produce in animals and man factitious diseases by inoculations or injections of putrid or contagious matter, having all the characteristics of the Essential fevers; and 3d, That Clinical observation establishes the fact that the blood is changed. And that the febrile phenomena present in these fevers indicate a condition of the system independent of inflammatory action, I infer from the fact—1st, That, in the absence of complication during the progress of the disease, there is no evidence of inflammation revealed by post mortem inspection; and 2d, That the symptoms co-exist with a diminution of the fibrin of the blood, and diminished tolerance of the loss of blood. In some of the most malignant forms of fever—those in which the fibrin of the blood

is at its minimum—there is often not much heat of body, and but little increase of pulse. The patient often dies in the cold stage of such fevers, without, in fact, having any fever! Evidently, therefore, the term *fever* may be used in two very different senses—in one signifying a collection of symptoms depending on local inflammation—and in the other a *condition* of the system entirely independent of such inflammation. In one the term indicates the name of a *disease*, and in the other the name of a *symptom*. Hence the distinction between Essential and Symptomatic fevers, and hence the inference, also, that the Essential fevers have their origin in certain qualitative changes of the blood, caused by the introduction of foreign matters.

Further proof that the general class of diseases which have been termed Zymotic have their origin in the blood, is drawn from the symptoms usually present. These will be found accurately detailed by all standard writers on General Pathology, under the head of "*Necraemia, or death beginning with the blood,*" such as petechiæ and vibices on the external surface, the occurrence of hemorrhage in internal parts, the general fluidity of the blood, its frequently dark and otherwise altered aspect, its proneness to pass into decomposition, the general prostration of all the vital powers, the dark tongue, sordes on the teeth, suspended secretion, and the general arrest of molecular nutrition. Indeed, the very *universality* of diseased action points to a cause more general than can be found in any individual function.

I have thus far spoken of admixture of foreign elements in the blood from *without*. There are causes, however, which operate upon it *intrinsically* as well as *extrinsically*. Thus, defective excretion is followed by a direct *backward* action on the blood, resulting in changes of its chemical or vital properties. The excretory organs are the natural emunctories through which effete matters, generated within the organism, are expelled from the blood: the product of the various excretions may be regarded, therefore, as the correct expression of the numerous changes that are taking place both in the healthy and diseased animal fabric. In febrile diseases these organs are generally suspended in the exercise of their healthy function, an increase of perspiration, or in the flow of urine, or a spontaneous diarrhœa being generally accompanied with a subsidence of the febrile phenomena.

Relatively considered, the *Kidneys* may be regarded as the most important emunctories through which morbid matter is expelled from

the blood. The experiments of Orfila on this subject are highly satisfactory. He found that the pernicious effects of small and repeated doses of arsenic could be readily averted in animals by giving them, at the same time, a diuretic medicine; and the converse fact has been frequently observed, namely, that persons who suffer from disease of the kidney, by which its function is impaired, very readily contract infectious diseases, and are apt to suffer from their effects. It has also been observed that opium, arsenic, mercury, &c., operate with dangerous energy on such patients.

The experiments of Dr. Golding Bird are very conclusive on this subject. His observations have been extensive and accurate. Two of many cases, are here given. In the first, a case of ague, the patient was kept in the Hospital from the 23d of May to the 16th of June following.

The following is his table of analysis :

| | | | | | | | | | | |
|------|-------|--------|----|------|-------|-----|------|------|-------|--------------|
| May | 23rd. | Passed | 12 | ozs. | urine | and | 352 | grs. | solid | constituent. |
| " | 26th. | " | 40 | " | " | " | 828 | " | " | " |
| " | 28th. | " | 35 | " | " | " | 725 | " | " | " |
| " | 30th. | " | 48 | " | " | " | 1054 | " | " | " |
| " | 31st. | " | 45 | " | " | " | 743 | " | " | " |
| June | 2nd. | " | 35 | " | " | " | 514 | " | " | " |
| " | 4th. | " | 30 | " | " | " | 879 | " | " | " |
| " | 6th. | " | 27 | " | " | " | 1036 | " | " | " |
| " | 7th. | " | 35 | " | " | " | 436 | " | " | " |
| " | 9th. | " | 40 | " | " | " | 1172 | " | " | " |
| " | 11th. | " | 45 | " | " | " | 742 | " | " | " |
| " | 13th. | " | 40 | " | " | " | 916 | " | " | " |
| " | 14th. | " | 43 | " | " | " | 984 | " | " | " |
| " | 16th. | " | 37 | " | " | " | 1044 | " | " | " |

There was a decided improvement, says Dr. Bird, on the 30th, severe paroxysm on the 3d, better again on the 6th, and no return of the ague after the 9th.

In the second case of ague—girl aged 19—patient was kept in Hospital from 23d of May to June 7th. On the 23d of May there was a severe paroxysm, and the amount of solids excreted was 280 grs. On the 27th she had a return of paroxysm and there were 280 grs. solid constituents in the urine. On the 28th she was better, and the solid

constituents in the urine. On the 28th she was better, and the solid constituents amounted to 538 grs. On the 30th they amounted to 625 grs., and from this time the patient rapidly got well.

In this, also, it will be observed that *pari passu* with the patient's improvement there was an increase of the solid constituents of the urine. In Typhus and other adynamic forms of fever, the same facts have been observed.

Are we to infer, however, from these observations, that defective excretion is the primary *cause* of the fever? By no means. That would be an imperfect view of the pathology of these fevers. I can conceive of no instance in which a lesion of secretion can be properly classified among the *primary* elements of disease. Some change must precede it, either of structure, of innervation, or of the blood from which the secretion is formed. The examples cited simply show the curative effects of the removal of foreign matters from the blood by means of depurating organs, and at the same time go far towards establishing the ancient doctrine of *critical discharges*.

They also serve to point out the two causes of disease which constantly present themselves for our consideration—causes *extrinsic* and causes *intrinsic*. Of these one or both may be in active operation.—It is an erroneous dogma to suppose that but one poison can act on the system at a time. As rational would it be to suppose that but one medicinal agent can produce its effects upon the constitution at a time.

I have already alluded to the fact, demonstrated by observation, that different poisons spend their influence upon different tissues of the body. Is it an unwarrantable speculation to transfer this law of *specific contamination* to the structure of the blood, and thus explain the action of different foreign bodies upon that fluid? Some poisons may be regarded as comparatively innoxious; they emerge from the body unaltered, with one or more of the ordinary secretions: others destroy some element of the blood (or its corpuscular element in the lymphatic glandular system,) so that it is never again susceptible to the action of the same poison, as in the case of some of the eruptive and contagious diseases; while others, by entering into chemical union with one or more elements of the blood essential to life, destroy its vitality and general necræmia and molecular death soon follow.

This will be recognized as an unproven speculation of the old fashioned Humoral Pathology. And, in the absence of positive proof, I

do not, of course, offer it as one of the "fixed facts" in Medical Science. Yet observation, reason and analogy throw around it a *plausibility* that entitles it to still further investigation.

In submitting these views I would not be understood as attempting to sustain an exclusive Humoral Pathology; nor would I underrate the importance of pathological changes in the solids. With Bichat, I regard "every exclusive theory, whether of Humoralism or Solidism, as a pathological absurdity." The relation between them is too direct and intimate to be ever separated; neither can the one or the other ever be regarded as an "exploded" system. Humoralism will never be exploded as long as the blood is the source of life to the tissues of the body; nor will Solidism be disregarded as long as the tissues continue to undergo change from altered conditions of the blood. My object is rather to fix the mind upon what I regard as an important truth, viz., that in all Essential or Idiopathic fevers, changes of the solids depend on previous alterations (quantitative and qualitative) of the blood.

This altered condition of the blood is soon made manifest by general febrile phenomena. The nervous centres, depending for their powers directly upon the state of integrity of this fluid, become perverted and weakened in action; the functions of animal and organic life are depressed; passive congestion, induced by depression of nervous power, follows; and hence the torpor and arrest of glandular action, and the sluggish and languid state of all the functions so characteristic of these fevers.

The importance of all these conditions I would by no means under-rate. They present to us, indeed, an exceedingly interesting field of inquiry. From an impression first made upon the nutritive and assimilative functions, we are at once introduced to multiplied elements of disease. There is not a function, not a nerve, not a gland, not a capillary vessel of the body but must feel the depressing effects of a contaminated condition of the blood. And this sluggish and languid state of the excretory organs becomes the cause of a still more poisoned condition of the blood, until this source of life becomes itself dead, and spreads death instead of life throughout the body.

The admittance of the Zymotic theory into the field of pathology would doubtless lead to greatly increased knowledge of the real na-

ture of diseased states. In a large class of fevers it points out the only two modes of cure: 1st. To counteract the injurious operation of the poisons: 2nd. To expel them from the system. The first of these indications is carried out in low typhus and adynamic forms of fever by the administration of saline medicines, such as the chloride of sodium, the chlorate of potash, hydro-chloric acid, &c. Arsenic, quinine, alcohol, and other antiseptic remedies are also valuable agents in arresting the Zymotic condition of the blood.

The other indication is the one most usually pursued; viz., to expel the offending matters from the system. This may be said to be Nature's mode of cure; and in the absence of reliable knowledge as to the nature of the poison and its antidote, the physician can only aid nature in her work of elimination. This he attempts by the administration of tonics, stimulants, supportants and depurents. The powers of life must be supported while Nature effects the cure. But even in her own work of depuration Nature may be greatly aided. The kidneys, skin, and alimentary canal are the principal channels through which foreign matters are expelled from the blood; and hence the utility of diuretics, aperients, and the so-called *Water cure*. The latter, by a combination of diuresis and diaphoresis, may be rendered a most powerful therapeutical agent in cutting short a fever in its premonitory stage, or at its final accession. The absurdity of hydropathy, as a one-ideal system of cure, is its blind and indiscriminate application to every variety of disease: and it is to be regretted that a remedy of such valuable therapeutic power is frequently brought into undeserved disrepute by falling into the hands of ignorant intermeddlers with nature.

If the views of the pathology of Essential fevers which I have presented, be correct, it is almost impossible to avoid giving assent to the doctrine that regards the fever as an effort of the "*vis medicatrix*," instituted for the purpose of expelling the poison from the system; and, while it repudiates the doctrine of the boasting fever curer, as well as the doctrine of non-interference, which has been aptly styled a "*meditation on death*," it rests upon the great physiological truth, that Nature is ever active in her recuperative powers, and is after all the best and wisest of physicians.

This pathology also offers the most rational explanation of the modification of diseased action growing out of prevailing *Epidemic influen-*

ces. It fixes the mind upon two controlling elements of disease; *first*, upon the depressing effects of a Zymotic poison by inducing changes in the blood; *second*, the local inflammatory or functional complication that may be engrafted upon and influenced by this altered condition of the blood. It thus draws the line of demarcation between general and special pathology, by keeping in view *constitutional conditions as modifying local action*, and by this means enables us to comprehend the most important question, practically considered, within the wide range of medical inquiry—the distinction between *Sthenic and Asthenic* diseases, between depressed and exalted action. Its tendency is to give us broader views and clearer conceptions of the varied elements of disease as they act and re-act, and insensibly shade into each other.

It modifies, moreover, and renders more rational, the *treatment* of disease. Does an inflammatory affection overtake one whose blood is contaminated by an epidemic influence, or by putrid emanations, vegetable or animal; or whose blood is only imperfectly or badly repaired by insufficient or unwholesome diet?—then, of course, the inflammation is *asthenic* in character, and blood-letting and other antiphlogistic remedies must be resorted to, if at all, with great caution. If the blood has been “touched corruptibly” by an epidemic influence, or a typhoid poison, we must husband rather than depress the flagging powers of life. To adopt, in such cases (as we fear is too often done), the ordinary treatment for an acute pneumonia or dysentery, as the case may be, regardless of the evidence of *blood disease*, such as loss of tone and strength of the vascular system, sluggish functions, dull mental faculties, feeble and compressible pulse, and brown or dark tongue, would be to hasten the dissolution of the patient, and bring both doctor and medicine into disrepute. The great secret of success in the treatment of disease is to be found in a broad, comprehensive and rational pathology,—a pathology that weighs every element of disease, whether of fluids or of solids, that is capable of exciting, depressing, or perverting vital actions.

I have thus ventured to present a few facts with the hope of calling attention to a subject which may not, as yet, have occupied the minds of some members of the profession: and although I may have presented but a dim vision of the true light, yet “I TRUST I HAVE GOT HOLD OF MY PITCHER BY THE RIGHT HANDLE.”

MEDICAL THEORIES.

The history of Medical Science is the history of Medical theories: and, although many of them appear to differ widely with each other, these differences will be found, on examination, to be more apparent than real, often more in words than things, and *incomplete* rather than *false*. — The subject which I have presented in the foregoing Essay, is now attracting the attention of some of the best medical minds of Europe; and yet pathological changes of the blood is an *old* doctrine, —old as the history of Medical Science. The Zymotic Theory of disease has existed, under some form, since the days of HIPPOCRATES; and a lapse of two thousand years has but confirmed many of his views. True, he was a Humoral pathologist in the fullest sense of the term; yet his pathology of disease, although simple, was the result of close observation. He taught that disease consisted in a morbid state of the fluids, and that Nature cures by certain evacuations, as of sweat, urine, &c. Who doubts his doctrine at the present day? Who can gainsay his facts? But Hippocrates did not see the *whole truth*. He failed to estimate the importance of a healthy *equilibrium* of the blood. This was left for Themison, who, not taking an enlarged view of the varied elements of disease, made capillary congestion embrace almost the whole domain of pathology. One dealt with changed *qualities* of the blood, the other with its changed *quantities*, and each taught an important truth. So also Brown, the “child of genius and misfortune,” was so enraptured with one or two truths that he was never able to see any others; and although simple *over-action* and *under-action* frequently attend disease, they constitute but fragments, as it were, of a more perfect pathology; and the lancet and the brandy bottle, although good in their place, constitute a very incomplete magazine of therapeutics.

Thus it has been from the days of Hippocrates to the present. The most brilliant lights that have gilded the skies of medical philosophy, have taken partial views of subjects in their nature and extent complex and vast. Yet one has contributed a truth in physiology, another in pathology, and still another in therapeutics. The accumulation of these has greatly enriched our medical literature, and enlarged the boundary of our knowledge. We now have spread out before us the ingenious and truthful inferences of a Laennec, an Andral and Gavarret: the patient and philosophical researches of a Golding Bird; the

practical truths of a Williams and a Watson; and the clear and comprehensive conclusions of a Forrey based upon the comparative statistics of more than three fourths of the earth's surface.

The object of all research has been to arrive at the best, the true theory; and yet, amidst our vast accumulation of facts, we may well stop and enquire: Has a true and complete theory of Medical Science been established? Surely no rational mind can so claim. If not complete, then, what is our relation to the past? In the rejection of old and the establishment of new theories, have we made progress, or have we not? If the world has not been benefitted by these inquiries, and the aggregate duration of human life has *not* been lengthened, then there has been really *no* progress, and the zealous medical inquirer might well turn, in despair, from any further investigations. But if it shall prove that amidst all this conflict of opinion and theory, there has been a regular and steady progress in the establishment of those medical truths upon which the science at present rests, it will be an inducement for us to set out on a fresh voyage of discovery with new hopes and energies. Haply *we* may return from our explorations the possessor of a new truth as a contribution to our divine art.

The fact that many a speculative theory has fallen before the rigid test of *inductive truth*, should not discourage us from making renewed efforts. Does it not prove, on the contrary, that we to-day occupy an advanced position in the healing art that we never before occupied? Truths have been preserved and errors have been discarded; the *chain of authority has been broken*, and the medical philosopher enquires for neither sect nor theory, but for TRUTH. Chemistry and the microscope are at this moment making rapid acquisitions of new truths and explaining old ones. It is a disingenuous and false charge, therefore, that Medical Science is stationary. In no department of human inquiry has there been greater progress: and in confirmation of the proposition that MEDICAL SCIENCE HAS MATERIALLY LENGTHENED HUMAN LIFE, I introduce, in conclusion, by way of Appendix to my Essay, the following statistics, bearing on this point, which I extract from the Annual Address recently delivered before the New York State Medical Society, and the Legislature then assembled in Albany, by ALONZO CLARK, President of the Society, and the distinguished Professor of Physiology and Pathology in the College of Physicians and Surgeons of the State of New York.

It is seldom, indeed, that we have condensed such an array of facts and figures bearing upon this point, and I am glad in this connection to avail myself of his labors.

VITAL STATISTICS.

Professor Clark first introduces the testimony of the great English historian, and proves by an unanswerable array of testimony, that medical science *has* greatly lengthened human life.

Macauley, in his history of England, says: "The term of human life has been lengthened in the whole kingdom, and especially in the towns. In the year 1685, not accounted a sickly year, more than one in twenty of the inhabitants of the capital died: at present only one in forty dies annually. The difference between London of the 19th century, and the London of the 17th century, is greater than the difference between London in ordinary years, and London in the cholera."

Dr. Simpson, in his paper "On the Statistics in Surgery," states, that in 1786 the yearly rate of mortality in the whole of England and Wales was *one in forty-two*; in 1801, it was *one in forty-seven*, and in 1831, it had diminished to *one in forty-eight*, showing a reduction of annual deaths by 28 per cent. in the short period of half a century. [Dublin Rev. vol. 7, p 97.

These statements correspond with deductions from the English parish registry returns, made by a careful student of statistics and distinguished writer of our own country, published in the 13th vol. of the American Journal of Medical Sciences. This registration, however, is incomplete, and the American writer points out the sources of this defect. It is not necessary to specify them here. They are believed to be constant, and nearly equal for the whole period; so that while the proportion of deaths to survivors is rated too low, the rating is equally too low for all portions of the half century. The error therefore, does not materially invalidate the great conclusion to which Dr. Simpson's figures would lead us. Marshall, in the publication of the bills of mortality, preserved in London since 1629, has given us the fullest confirmation of this gratifying fact, so far as this largest of towns can furnish it. Finlaison recognises it as an important element in the construction of his celebrated Annuity Tables.

Mr. Milne, in making up his well known *Carlisle* Life Tables, ascertained with the greatest care the deaths in that town and its vicinity, for the nine years following 1778: they were in the proportion of 1 to

39.99 of the population of each year. It is ascertained with equal certainty (see Registrar General's Reports) that for the seven years, ending with 1844, the deaths in this same Carlisle and its vicinity were annually 1 in 52.6. The interval between these two periods is just 50 years, and the reduction of mortality is 22 per cent.

The deaths in the town of Northampton were carefully studied during the latter part of the last century, and compared with the population. Dr. Price made this comparison the basis of some of his life tables. Here we have another unquestionable increase in the duration of life. The Registrar General, in his Report for 1847, says of this town: "In the last century, the people here lived about 30; now they live 37 years ($37\frac{1}{2}$). In earlier times their life must have been shorter. Then the community had no skilful physician, no surgeon—an infirmary, a dispensary, a lunatic asylum, and from 20 to 30 educated medical men, an evidence that more skill is now devoted to the preservation of life." Thus it appears that although this Northampton is even now one of the least healthful of all the smaller towns of England, yet that the decrement of deaths there is equal to 23 per cent.

These statements, I believe, exhaust the reliable statistics of England, bearing on the subject in which we are here interested, excepting only those that relate to annuitants and the insured.

The inquiry now naturally arises, is this the end? Can the life of man be still further prolonged? We would fain hope that its maximum duration is not yet attained, and this hope is not without encouragement. We learn from the Registrar General's Report, that the mortality of England was slowly but steadily diminishing, during the eight years from 1838 to 1846. The figures that represent its ratio to the living are for the several years respectively as follows, viz: 2.24, 2.187, 2.29, 2.160, 2.167, 2.12 and 2.082 per cent. But whatever view we are compelled to take of the future, who can doubt the cheering evidences of progress in the recent past?—substantial progress. I will adopt the suggestion of the Registrar General, and assume for the present, what I hope soon to prove, that what man desires most of all earthly things, is secured to him in fair measure, by the unobtrusive, unnoticed labors of our ill-rewarded profession. In the lapse of half a century, 28 persons, or if you prefer the lower estimate, 22 persons saved alive out of every hundred, all of whom must previously

have perished! What are all the other improvements of the same period, compared with this? What, though we boast that steam has been made the day laborer for the nations: what, though the steamship equals in magnificence the fairy palace of fiction, and skims the water with its wooden wings, as does a bird the air; what, though the iron ways encircle the earth, and daily exhibit, as I believe they do, the highest reach of human power, a perpetual wonder; what, though the electric fluid has become our news-carrier; what, though the arts have improved so as to cheapen many of the necessities of life to half their original cost! Neither of these, nay, all combined, can hardly single out the life that they have saved!

Again, France exhibits to us very strikingly the great results of professional labors. M. Charles Dupin, whose name is a sufficient guarantee for his statements, lately read before the Institute a paper on the vital statistics of that country, showing that from 1776 to 1843, (67 years), the duration of life had been increasing at the average rate of 52 days annually, so that the total gain in $\frac{2}{3}$ of a century amounted to $9\frac{1}{2}$ years; and that in no year of that period, whether during the Republic, the Consulate, or the Empire, did the annual increase fall below 19 days. What a fact have we here! Even during that dread period of French history in which the death angel assumed the cap of liberty, and taxed the arts for new inventions to destroy life, and during the succeeding 13 years in which the war spirit reaped an almost unprecedented harvest when science and arts vied with each other in contributing to this work of slaughter, and the history of Europe is but little more than the history of battles: during all this period, medicine alone lent all its energies to the preservation of life. How striking the contrast! How proud the success! In France, that glutted the guillotine with the blood of her sons, and strewed every battle field in Europe thick with their dead bodies; even in death-smitten France, medicine saved, in 20 years, more than war and the delirious spirit of freedom could destroy.

But we shall be told, doubtless, that we are claiming for our profession more than we have any fair right to; that society has improved in all its relations, and that to these improvements are due, in a fair proportion, the results which have been quoted. Let us consider for a little in what these improvements consist. Within 150 years, the arts have reduced the costs of many of the necessities of life; but

then the necessities of life have been actually multiplied by this same process of reduction, and food, the first of necessities, has not been cheapened: its money price is indeed less, but its labor cost is greater. The home condition of the laborer (I speak only of the countries from which I have drawn statistics) is more miserable than it was a century and a half ago. The rich have, it is true, become richer, but the poor have at the same time become poorer; in other words, wealth has greatly increased, but it is not distributed in other countries as it is in our own. Who that has visited the homes of labor in England or France, will believe that the over-crowded, half-clad, half-fed population of a manufacturing town can be compared in domestic comfort with the laboring classes of other times, when the honest housewife wrought out of the noisy wheel and loom the honest, warm, abundant homespun; when the labors of the field brought to a country, not over-populated, abundance of food; when labor had not yet destroyed its compensation by rivalry with itself; when the infirm poor were not yet so numerous that the benevolent rich could not look after them, and supply their wants. Who will believe that the crowded, hot, dusty, ill-ventilated manufactory can contribute to health like the open field where men once labored with its fresh breeze and its sun shine. The better and middle classes have always been long-lived. *Their* home condition may have been improved in the period referred to; but have they gained as much as the many, the laborers, have lost? I confidently believe that so far from their being a betterment in the social condition of Europe within 150 years, when a fair balance is struck, it will be found that things personal contribute less than formerly to prolong life. Still it cannot be denied, that in the general improvement of society has been done for this great object. It is in cities chiefly that these important changes are seen; and even there they are confined mostly to the rich, or at best are brought by the rich only to the doors of the poor, beyond which they rarely strive to pass. Staying as far as possible the spread of pestilence; improved ventilation in the widening of streets, and in the construction of dwellings and public buildings; diminishing the causes of disease by the removal of filth, and by a judicious drainage; and the encouragement of personal cleanliness, by making water abundant and bathing cheap; these, no one will deny, are benefits, solid benefits. *But all that is valuable in them is based on principles elaborated and promulgated by the medical profession.* Even

the details of the plans by which the public have realized these benefits, have in many instances been prescribed by the profession. There is an implied recognition of this fact, in the name "medical police" which is given to the department that governs most of these things, and still more in the fact that their supervision is in a considerable degree entrusted to an "inspector" chosen from the medical profession. These, then, are medical facts popularized, as are a thousand other medical facts in hygiene and the laws of regimen. May we not, then, freely imparting as we do to the public the advantages derivable from these things; may we not ask to be remembered as the authors of the doctrines from which these benefits flow.

There is another view of this subject. We hear enumerated among the causes of *tubercular consumption*, imperfect protection either by house or clothing, against the vicissitudes of weather; scanty and innutritious food; imperfect ventilation; vitiated air; dwelling in dark, damp places; indifference to personal cleanliness. When it is remembered that these are important points among the particulars in which it is claimed that society has so greatly improved, it will be expected that this formidable malady must gradually recede before the advancing improvements. But Sir James Clark assures us, (in his book on Consumption) that this is not the case. He has carefully studied the London bills of mortality, making annual averages for periods of ten years, to avoid the influence of epidemics and accidental agencies; and he finds that from 1700 to about 1830 there was no diminution in the frequency and the fatality of this disease, but rather that the *proportion of deaths from it has been increasing during that whole period*. At the same time this author fully confirms the statement already quoted from the history of England, by showing that the mortality from all diseases, consumption included, has diminished nearly one half; consumption excluded, more than one half. I need hardly add, that the profession has never claimed great control over this affection; and that during all the period here referred to, it was held to be incurable. This statement favors a conviction that the advantages we have gained over disease are more in actual practice than in prevention and hygiene.

But we have facts more directly to my purpose: such as will show the physician's care of the sick, freed from all other agencies that are supposed to have influence in prolonging life; and, comparing the re-

sults of that care, at different periods, our claims will be in no respect weakened.

Dr. Merriman deduces from the bills of mortality just referred to, the fullest evidence, that in the department in which he was so much distinguished, the most signal improvement has been made. In 1680, one in forty-four died while under the care of the medical attendant; within 50 years from that time, only one in seventy died under the same circumstances; in another term of 50 years, mortality was reduced to one in eighty-two; and in 40 years more (the period ending with 1820), it had fallen as low as one in 107. Here is a condition in which knowledge and skill are left to work their way unhindered and unhelped. Hygiene has little to do with it; the improvements of society even less. It is nature and the doctor, and how has the doctor triumphed?—fifty-nine per cent. of such as must have died in the latter years of 1600, saved in the progress of above a century and a half! This is doing something to lift from the sex the heavy weight of the primal curse; and we challenge, in return for it, their kind regard.

Let us now bring our inquiry nearer home. The records of the New York Hospital, a medical charity supported from the treasury of the State, show the mortality, together with the number of patients treated annually since its foundation. The first 50 years of its existence end with 1842. If this term be divided into periods of ten years each, the progressive improvement is uninterrupted; so that while the relation of deaths to admissions in the first 15 years was one in $7\frac{1}{2}$, in the last 5 years it is one in $11\frac{1}{2}$. This is a gain of more than 30-100, or 31 saved alive out of every 100 that formerly would have died. Now here is little besides medical treatment. The growth of the city has not materially improved the site of this Institution. The same building is now used that was used when it was opened, though others have been added. The wards were no more crowded through their early years than they were in 1842; the comfort of the patient has been equally cared for at both periods; and it is proper to give emphasis to the statement, that in this important result, vaccination has had no part. This inestimable discovery was made, it is true, early in this period of 50 years, but it could in no way have affected this hospital, because small pox has never been admitted into it since its foundation. What then have we here but improvement in the practice of medicine and surgery? And it cannot but be noticed, first, that the result here

recorded equals, even exceeds, what is claimed in society at large, from all beneficial causes operating together; second, that this result, gained without the aid of vaccination, shows that, great as is the amount of good done by this discovery, it is far from being the only life-saving agency by which the world has been blessed in the past half century.

The important deductions here made from the statistics of the N. Y. Hospital are sustained by similar facts as collected from the records of the Pennsylvania Hospital, Philadelphia. That Institution was opened for the reception of patients in 1752. Its first 90 years were completed, then, in 1842. During this period it received 39,290 patients, and lost of that number 4,120. I have not been able to obtain annual reports, but the deaths for the whole term of 90 years were one in $9\frac{1}{2}$ of all admitted, while in the last of these years it was only one in 11.87. This gives us the last year better than the whole by more than 19 per cent.; an improvement we could only have been prepared for, after learning the striking facts substantiated by the fullest details from the N. Y. Hospital.

From the statistics of the last century it appears that the number of patients admitted into the Pennsylvania Hospital, in the ten years ending with April, 1852, was 13,472; of whom 1056 died, making the deaths a little better than 1 in $12\frac{3}{4}$. Thus we have a gain in the last ten years, over the preceding 90, of more than 25 per cent.

In appreciating the value of these facts, it must be borne in mind that the physicians and surgeons to whom hospital duties are assigned, are but the representatives of their profession. They are the exponents, the public manifestation of its condition. What they do within the hospital walls, others are doing in private circles, each in his own proper sphere.

Is it not true, then, that medicine is the first of the progressive arts; and not first only, but incomparably above and beyond all others in the priceless benefits it has bestowed on man? Yet who has risen up to give it public thanks for its herculean labors? Who has proposed to commemorate the vast achievement of prolonging the years of the life of man more than one-fourth their former average, throughout civilized Europe and America, in the short period of half a century?

When a great canal or railroad is completed, the air is rent with clamors. Men's voices are inadequate to express their joy, and can-

nons thunder forth their glad congratulations. Orators speak of "the marriage of mighty waters;" and men, as they meet in the street, say, the great work is accomplished. Well, is it not better thus?—for what celebration can adequately commemorate these triumphs of medicine! What monument can typify their greatness? Yet we have a right to demand a fair estimate of the value of our profession to society, and an honest acknowledgment of what it has done for the well being of man. Grant us this, and, by the blessing of God, we will raise our own monument; it shall be the armies of living men our hands can rescue from the grave.

